

ORIGINAL ARTICLE

Density, viscosity, and refractive index of mono-, di-, and tri-saccharides in aqueous glycine solutions at different temperatures

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Received 12 September 2013; accepted 28 August 2014

KEYWORDS
Glycine;
Saccharose;
Refraction;
Aqueous glycine;
Solvent-solute interaction

Abstract Density, viscosity, n_D and refractive index, n_D of glucose, sucrose, and raffinose have been measured in 0.05 M aqueous glycine at 288.15, 303.15, 308.15, and 313.15 K. From these experimental data, apparent molar volumes, V_a , apparent specific volumes, v_a , as a function of the concentration of solute, the standard partial molar volume, V_a° , transfer volume from water to aqueous glycine solution, ΔV_{tr}° , and partial molar expansibility of solute, β_a° have been calculated for glucose, sucrose and raffinose in aqueous glycine solution. Pitzer-type coefficients A and B and Debye-Hückel coefficient B , free energies of activation of viscous flow per mole of solvent, $\Delta G^\ddagger$, and values, $\Delta H^\ddagger$, enthalpy, $\Delta S^\ddagger$, and entropy, $\Delta S^\ddagger$ of activation of viscous flow have been evaluated by using viscosity data. The molar refraction has been calculated by using measured refractive index data. Results have been explained in terms of solute-solute and solute-solvent interactions.
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1. Introduction

Saccharides are the most abundant and diverse classes of organic molecules found in nature and their conjugates with proteins and lipids play key roles in the immune and endocrine systems, fertilisation, brain development, prevention of pathogens and blood clotting (Solera, 2012). They serve as energy sources (Gallia, 2012; Wang et al., 2012; Kuczyk et al., 2008) and play a very crucial role in biological recognition phenomena in the process of exchanging information between the cells like cell-cell interactions and cell death signal transduction inflammatory processes, cancer metastasis (bacterial and viral infections, facilitating the researchers to design a new category of anticancer drugs (Kishida, 2012; Carroll et al., 2004; Kuroki et al., 2013). Recently, Montecarlo and co-workers designed saccharide based glycerol-solvent transporters which are of great interest for both technological and biomedical applications (Montecarlo et al., 2013). Interactions of saccharides with proteins play an important role in a wide range of biochemical processes, for example, the application of saccharides as hypotonicity. It is well-known that there are a lot of protein pharmaceuticals which are prepared by